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Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

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Im Auftrag

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Preventing unauthorized hoistway acces

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Preventing Unauthorized Hoistway Access

The invention relates to a means and method of preventing unauthorized access of personnel into the hoistway of an elevator system. In particular the invention provides a specific landing door lock with an auxiliary release mechanism which can only be actuated during maintenance or emergency conditions hereinafter referred to as abnormal operating conditions.

In modern elevator systems it is common practice to provide a lock on each landing door of an elevator system. The lock has two specific mechanisms that are employed to unlock the landing door. The first is the main release mechanism which is actuated during normal operating conditions of the elevator by a retractable cam mounted either on a car of the elevator or on the landing door. Accordingly, when the car reaches the desired floor, the main release mechanism is actuated on the neighboring landing door thereby enabling transferal of passengers between the car and the floor. Naturally there are occasions (during maintenance or emergency conditions for example) when it is necessary for authorized personnel to gain direct access to the hoistway from a floor. For this purpose the lock further includes an auxiliary release mechanism. Generally, the auxiliary release mechanism is actuated manually by an appropriate key in the possession of the service engineer or firefighter (authorized personnel) and the landing door can then be opened manually. It has become apparent that this security precaution is no longer adequate to prevent unauthorized personnel such as vandals from opening the landing door and causing damage to elevator equipment as well as endangering their own safety.

To ensure ease of use and universal applicability for all elevator systems within a particular region or area, the key for the auxiliary locking mechanisms is typically of a simple design. For example in Europe, the relevant standard, EN 81-1:1998, specifies that the key will fit an unlocking triangle which is accessible from the landing. The unlocking triangle is shaped as a solid equilateral triangle with rounded corners. A person who is determined to enter the hoistway can easily replicate a key that will fit the unlocking triangle. Occasionally, the unlocking triangle may be covered with a screw cap or plug however these are not particularly effective deterrents and do not prevent deliberate misuse.

Again the solution does not prevent the would-be vandal from attempting to gain access to the hoistway, an act which itself may be extremely hazardous as a makeshift replica key could become securely lodged in the keyhole preventing subsequent operation by authorized personnel, particularly during emergency procedures.

The principal objective of the present invention is to overcome the shortcomings of the prior art by providing a more secure means and method of preventing unauthorized access hoistway access within elevator systems.

This objective is achieved by the invention as defined in the appended claims.

By way of example only, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings, of which:

FIG. 1 is a plan view of a conventional elevator floor arrangement comprising landing doors fitted with a lock having main and auxiliary release mechanisms;

FIG. 2 is a perspective view of a typical unlocking triangle;

FIG. 3 is an expanded view of the keyhole through which the unlocking triangle of Fig. 2 is passed to activate the auxiliary release mechanism when emergency or maintenance access is required;

FIG. 4 is a perspective view of keyhole surround according to a first embodiment of the invention mounted on a side-facing surface of a door frame of an elevator floor arrangement;

FIG. 5 is an exploded perspective view specifically illustrating components of the keyhole surround of Fig. 4;

FIG. 6 is a cross-sectional, partial view of a hoistway of an elevator system incorporating the keyhole surround of Figs. 4 and 5;

FIG. 7 is a schematic of an energization circuit for controlling movement of the ferrous disc housed within in the keyhole surround of Figs. 4 and 5;

FIG. 8 is a perspective view of a keyhole surround according to a second embodiment of the invention;

FIG. 9 is a cross-section of the keyhole surround of Fig. 8;

FIG. 10 corresponds with Fig. 8 but illustrating the keyhole surround in abnormal operating conditions rather than normal operating conditions;

It will be appreciated that the keyhole 10 need not be provided in the doorframe 4, but in any other exposed surface of the elevator floor arrangement 1. In many instances, the keyhole 10 is located in a landing door 2.

Figs. 4 and 5 show a keyhole surround 14 according to a first embodiment of the present invention. Although Fig. 4 specifically shows the keyhole 10 provided in, and the surround 14 mounted on, a side-facing surface of a doorframe 4, it is equally acceptable for the surround 14 to be retrofitted on the floor-facing surface of the doorframe 4 so as to surround the keyhole 10 shown in Figs. 1 and 3.

As illustrated in Fig. 5 the surround 14 includes a substantially concave housing 16 with an integral through-hole 18. The surround 14 is mounted to the doorframe 4 by screws (not shown) which engage with the screw holes 19 in the housing 16. When mounted, the through-hole 18 of the surround 14 is concentrically aligned with the keyhole 10 and a cavity C is defined between an internal wall of the housing 16 and the doorframe 4. The cavity C accommodates two electromagnets 20 that are fixed to the internal wall of the housing 16 at opposing positions equidistant from its center. A bottom end of a spiral pin 22 is mounted to the center of the internal wall of the housing 16. This pin 22 is used to support and guide a ferrous disc 28. A compression spring 24 which envelopes the pin 22 biases the disc 28 away from the housing 16 in direction A towards a screw 26 fastened to a top end of the pin 22. An access hole 30 is formed in the disc 28.

During normal operating conditions, the electromagnets 20 are not energized and the spring 34 retains the ferrous disc 28 against the screw 26 in an initial position shown in Fig. 5. In this position, the access hole 30 of the disc 28 is not aligned with the concentric holes 10 and 18 in the frame 4 and surround 14, respectively. Accordingly, the ferrous disc 28 blocks access to the unlocking bit 12.

In abnormal operating conditions, the electromagnets 20 are energized to exert an attraction force on the ferrous disc 28 in direction B. Initially this magnetic force is greater than the counteracting biasing force of the spring 24 resulting in movement of the disc 28 along the spiral pin 22 in direction B. Such movement causes simultaneous rotation of the disc 28 in the clockwise direction E. The disc 28 comes to a rest position when the opposing forces are equalized. In this position, as shown in Fig. 4, the access hole 30 in the disc 28 is aligned with the through-hole 18 of the surround 14 and the keyhole 10 in

The pillars 38 and 40 can be manually activated for example by an appropriate wire or rope and pulley arrangement from a machine room of the elevator system or from a control panel provided in a landing doorframe 4. Alternatively, they could be activated by electric actuators controlled by a switch in the machine room or the control panel. In a preferred embodiment, electric actuators are used which are activated by remote control from a transmitter integrated into the unlocking key 8.

As shown schematically in Fig. 6, two sensors 44 are provided on the pit floor of the hoistway 32 to provide signals 48 and 50 indicative of the position of the car pillar 38 and the counterweight pillar 40, respectively. When either pillar 38 and 40 is in the upright, actuated position, the corresponding pillar signal 48 and 50 is used to automatically close a corresponding switch 45 onto the energization circuit 51 for the electromagnets 20 in the keyhole surround 14 as shown in Fig. 7. Accordingly, the power source 52 produces a current passing through the electromagnets 20. The ferrous disc 28 is attracted towards the energized electromagnets 20 and rotated in the clockwise direction E permitting the engineer to insert an unlocking key 8 through the keyhole 10 to actuate the unlocking bit 12 and release the landing doors 2.

It will be understood that any car or counterweight travel blocking apparatus which is movable into a position where it prevents travel of the car 34 into a temporary working space could be substituted for the pillars 38 and 40. Examples include bolts or latches which extend from the car 34 to abut stops on guide rails supporting the car or on the walls of the hoistway 32, levers or latches extending from the guides rails or walls of the hoistway 32 to engage the car 34 or counterweight 36, pivotable buffers mounted in the hoistway and means for locking a governor rope in one or more predetermined positions.

In the event of a fire or other emergency, a conventional emergency circuit 42 associated with the elevator system can be used to provide an emergency signal 46 to automatically close an associated switch 45 onto the energization circuit 51. The emergency circuit 42 can be activated by signals from appropriate detectors (fire detectors, earthquake detectors etc.) or switches within the building or remotely for example from a fire station. In a preferred embodiment, in addition to the above activation means, the emergency circuit 42 also includes a receiver that is responsive to a transmitter built into the unlocking keys 8 provided to firefighters.

guide a ferrous lever 156. A compression spring 150 and bearing surface 152 surround the pin 148 and are used to bias the lever 156 away from the housing 142 in direction O towards a screw 158 fastened to a top end of the pin 148. A ball bearing 154 is provided between bearing surface 152 and the lever 156 to permit free relative rotation. Furthermore a coil 146 surrounds the base of the spiral pin 148. The housing 142 also accommodates a permanent magnet 146.

In contrast to the previous embodiments, the ferrous lever 156 is biased towards and stable in two positions (bi-stable). During normal operating conditions of the elevator, the lever 156 is biased by the spring 150 against the screw 158 in the position shown in Fig. 12 to obstruct the through-hole 144.

During maintenance or emergency conditions, an energization circuit provides a current pulse to the coil 146 to attract the lever 156 in direction M. This attractive force is greater than the biasing force of the spring 150, resulting in movement and rotation of the lever 156 in directions M and N respectively along the spiral pin 148. When the lever 156 is over the permanent magnet 145, the permanent magnet 145 exerts sufficient magnetic force on the lever 156 to overcome the bias of the spring 150 and so retain the lever 156 in a position where it no longer obstructs the through-hole 144.

On re-establishment of normal operating conditions, the energization circuit provides a reversed current pulse through the coil 146 to move the lever 156 in directions O and P and the spring 150 further biases the lever 156 to the initial position where it obstructs the through-hole 144.

Again, since the coil 150 needs to be energized in both directions in this embodiment, the energization circuit 51 and switches of Fig. 7 would need to be modified accordingly.

Fig. 13 shows a slide gate arrangement 70 according to a fourth embodiment of the present invention. Contrary to the previous embodiments the arrangement 70 is mounted on a rear (hoistway 32 facing) surface of a doorframe 4 of an elevator system. The arrangement 70 includes a slide gate 72 that is supported on the surface of the doorframe 4 by a plurality of strappings 74 which are fastened to the frame 4 by suitable means such as rivets 76. A distal end of the slide gate is provided with a rack 78 which engages with a pinion 80 driven by a small bi-directional electric motor 82.

holes 108. The coil 114 is accommodated within a recess 122 in the base plate 116. The ferrous slide key 124 is accommodated within a through-hole 118 in the base plate 116. The slide key 124 has an end with a hollow-triangular profile 128 for continuous engagement with a conventional unlocking bit 12 and an opposing end with a octagonal head 126 and a hollow 129 to partially accommodate a compression spring 112.

The keyhole mounting 100 is fixed to a conventional doorframe 4, such that the through-hole 118 of the base plate 116 coincides with the keyhole 10 in the doorframe 4. The ferrous slide key 124 is biased in direction G by the compression spring 112 so that its hollow-triangular profile 128 continuously engages with the triangular unlocking bit 12 of the auxiliary release mechanism. The concave housing 102 (and the actuation plate 106) is free to rotate with respect to the base plate 116 on bearings 120.

During abnormal operating conditions, the coil 114 is energized (for example by the energization circuit 51 of Fig. 7) and thereby draws the slide key 124 against the bias of the spring 112 in direction F to a position where its octagonal head 126 engages with a corresponding octagonal socket 110 in the actuation plate 106. In this position the slide key 124 is still in engagement with the unlocking bit 12. Accordingly, rotation of the concave housing 102 will lead to simultaneous rotation of the actuation plate 106, the slide key 124 and the unlocking bit 12 to release the door 2.

Once the normal operating conditions have been reestablished, the coil is de-energized and the spring 112 forces the slide key 124 along direction G thereby decoupling it from the actuation plate 106.

As equipment and procedures for remote transmission of signals have become much more reliable and secure over recent years, it is predicted that remote actuation of the auxiliary release mechanism rather than manual unlocking will become more prevalent within the elevator industry. Clearly, the present invention could be employed in such a system as illustrated in Fig. 16. The energization circuit 130 shares many of the components of the previously described energization circuit 51 of Fig. 7, but instead of selectively permitting or preventing manual actuation of the auxiliary release mechanism by means of unlocking bit 12, the circuit 130 incorporates a motor 132 which actuates the auxiliary release mechanism. Consequently as a keyhole is no longer required, the aesthetics of the floor arrangement can be improved.

Claims

1. A security device (14,54,70,100,140) for mounting in the vicinity of an auxiliary release mechanism of a landing door (2) of an elevator system, the security device comprising:

an energization circuit (51,130)

CHARACTERISED IN THAT, in use, the energization circuit (51,130) is responsive to changes in operating conditions of the elevator system to selectively prevent or permit actuation of the auxiliary release mechanism.

2. A security device (14,54,70,100,140) according to claim 1, wherein the energization circuit (51,130) comprises a power supply (52) and at least one switch (45) closing onto or breaking the energization circuit (51,130) in response changes in the operating conditions of the elevator system.

3. A security device (14,54,70,100,140) according to claim 1 or claim 2, further comprising a member (28,64,72,124,156) movable in response to the energization circuit (51) between a first position preventing actuation of the auxiliary release mechanism during normal operating conditions and a second position permitting actuation of the auxiliary release mechanism during abnormal operating conditions.

4. A security device (14,54,70,100,140) according to claim 3, wherein the movable member (28,64,72,156,124), in use, either:

obstructs a keyhole (10) in the first position and in the second position permits key (8) access through the keyhole (10) to actuate an unlocking bit (12) of the auxiliary release mechanism; or

slides between the first position where it engages with the unlocking bit (12) of the auxiliary release mechanism to the second position where it engages with the unlocking bit (12) and is additionally coupled to an actuation plate (106) such that rotation of the actuation plate (106) causes concurrent rotation of the unlocking bit (12) to actuate the auxiliary release mechanism.

a security device (14,54,70,100,140) according to any of the preceding claims mounted on at least one of the floor arrangements (1); and

an emergency circuit (42) to detect an abnormal operating condition and to provide an emergency signal (46) for the energization circuit (51,130).

11. An elevator system according to claim 10 further comprising:

at least one blocking device (38,40) movable into a blocking position to prevent travel of the car (34) into a temporary working space within the hoistway (32); and

a sensor (44) to detect the presence of the blocking device (38,40) in the blocking position and to provide a maintenance indication signal (48,50) for the energization circuit (51).

12. A method for providing access into a hoistway (32) of an elevator system having a car (34) within a hoistway (32) having a plurality of floor arrangements (1), comprising the steps of:

providing an auxiliary release mechanism in at least one of the floor arrangements (1);

CHARACTERIZED BY

monitoring operating conditions of the elevator system; and

selectively preventing actuation of the auxiliary release mechanism during normal operating conditions or permitting actuation of the auxiliary release mechanism during abnormal operating conditions.

13. A method according to claim 12, wherein an abnormal operating condition arises from at least one of fire, terrorist attack, flood, earthquake, hurricane and maintenance.

14. A method according to claim 13, wherein the maintenance abnormal condition is established by arranging a travel blocking device (38,40) within the hoistway (32) to prevent travel of the car (34) into a temporary working space within the hoistway (32).

ABSTRACT

Preventing Unauthorized Hoistway Access

The invention relates to a means and method of preventing unauthorized access of personnel into the hoistway of an elevator system. In particular the invention provides a security device (14) for mounting in the vicinity of an auxiliary release mechanism of a landing door to prevent actuation of the auxiliary release mechanism during normal operating conditions. The security device (14) comprises an energization circuit which, in use, is responsive to changes in operating conditions of the elevator system and may also include an obstruction member (28) movable in response to the energization circuit between a first position preventing key access through a keyhole during normal operating conditions and a second position permitting access through the keyhole during abnormal operating conditions. Accordingly, a key can only be inserted through the keyhole to actuate an unlocking bit of the auxiliary release mechanism to release the landing doors during abnormal operating conditions.

[Fig. 5]

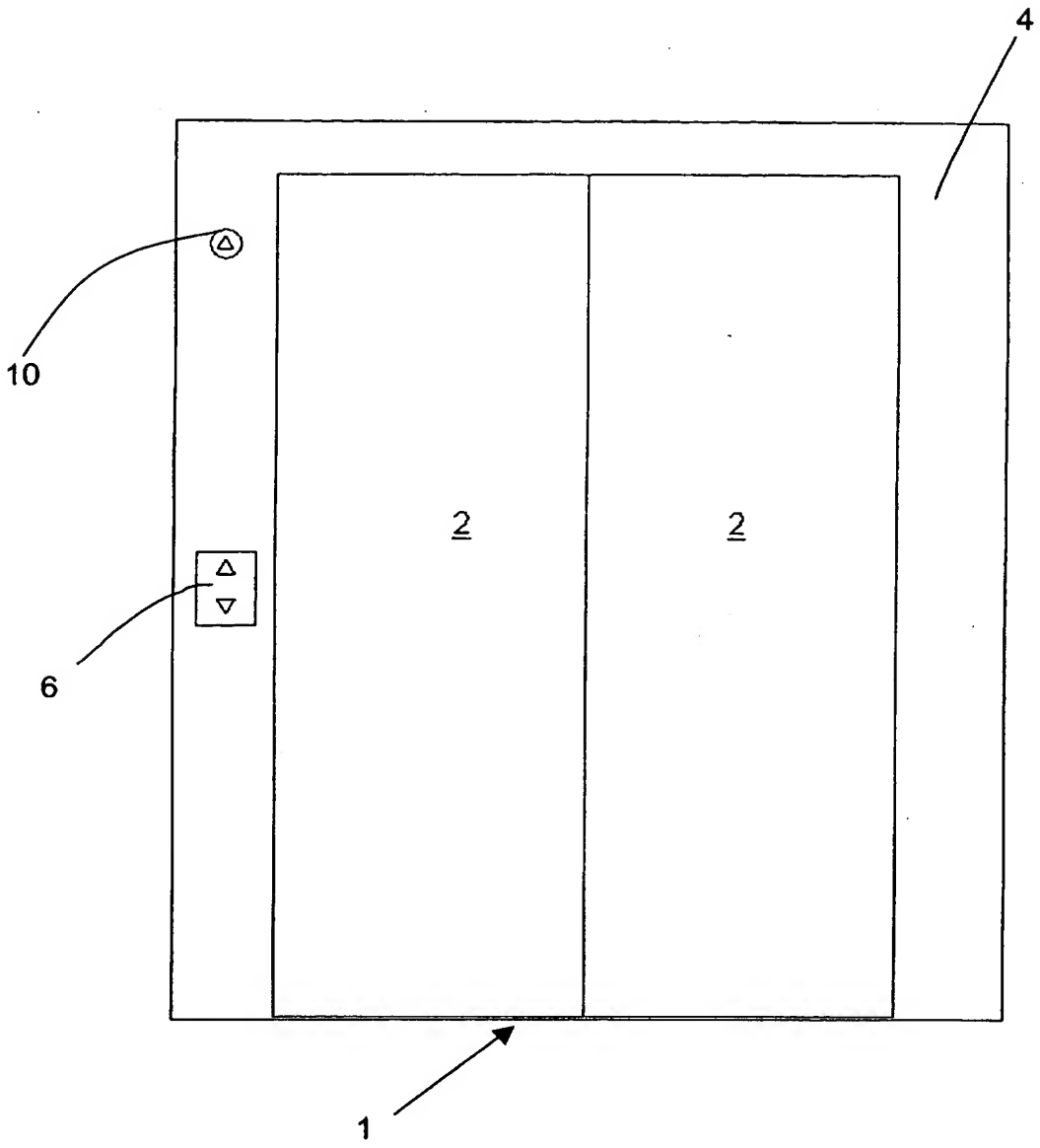

FIG. 1 (Prior art)

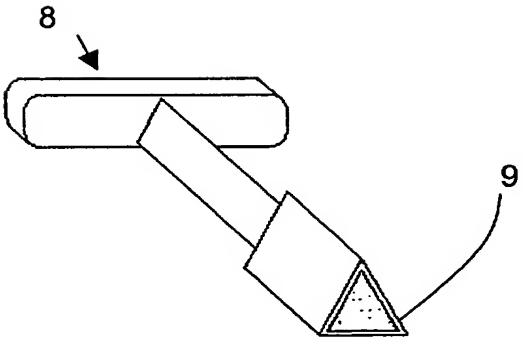

FIG. 2 (Prior art)

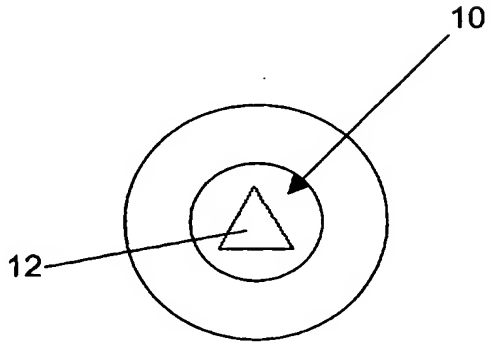

FIG. 3 (Prior art)

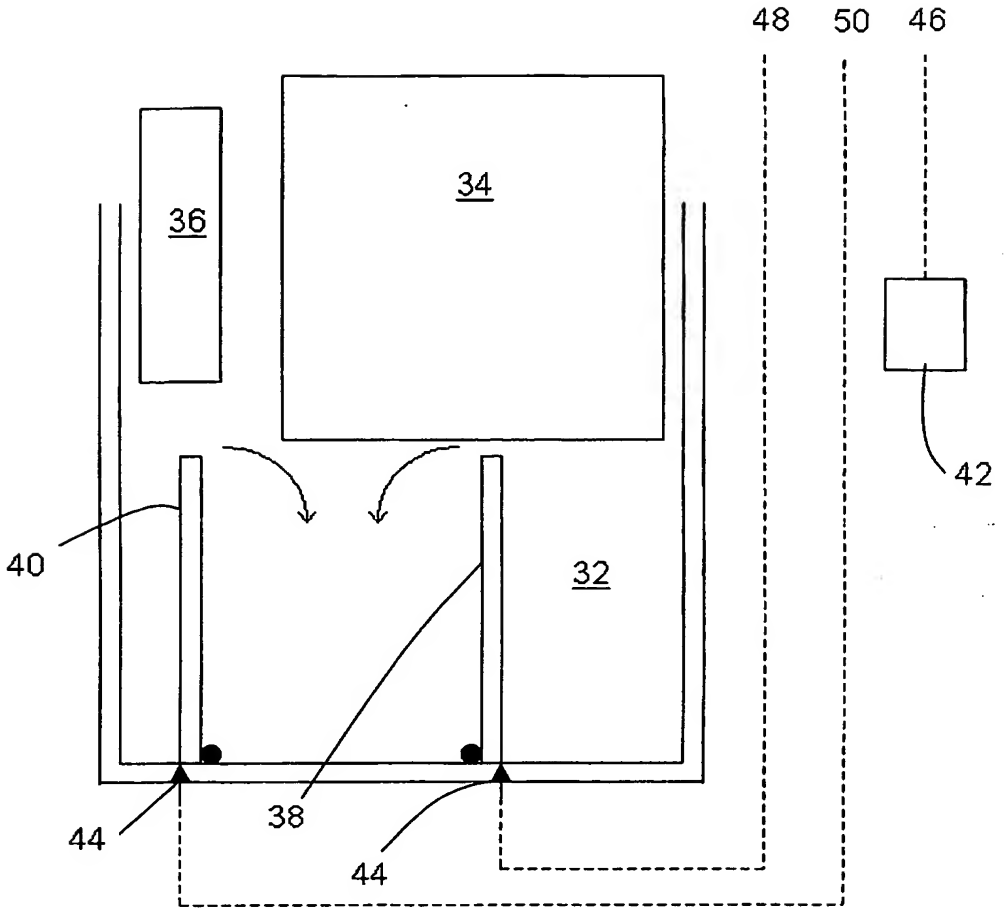

FIG. 6

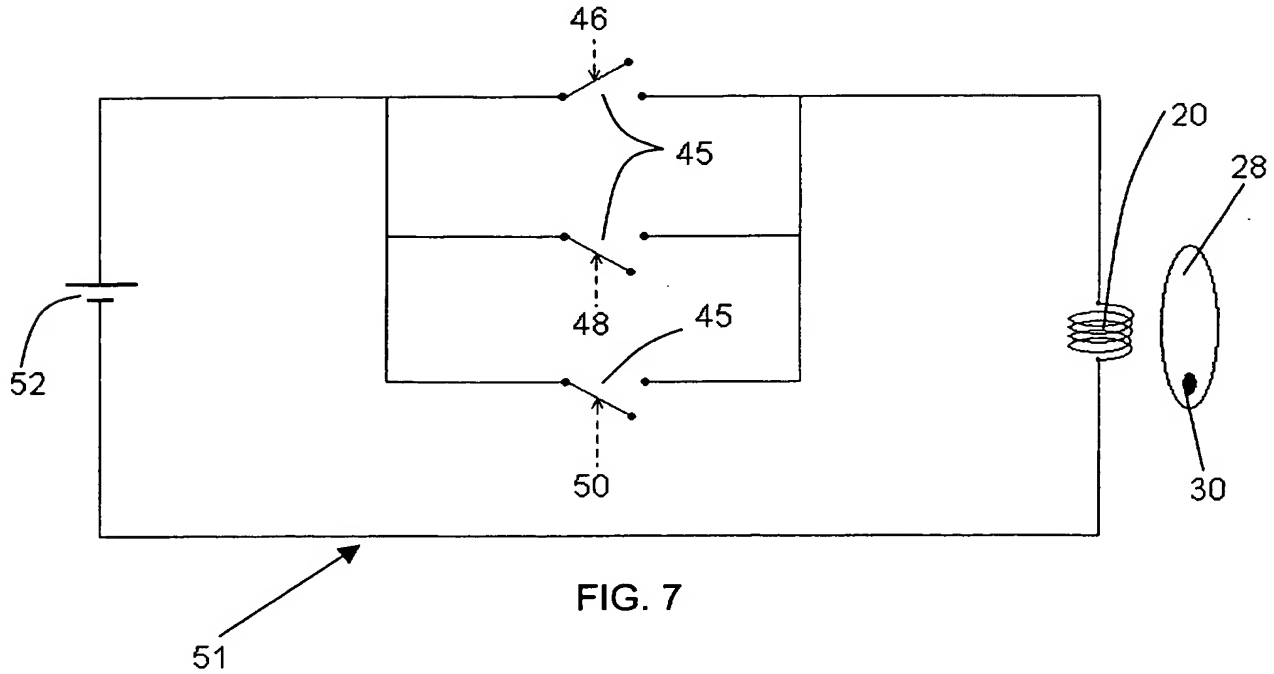

FIG. 7

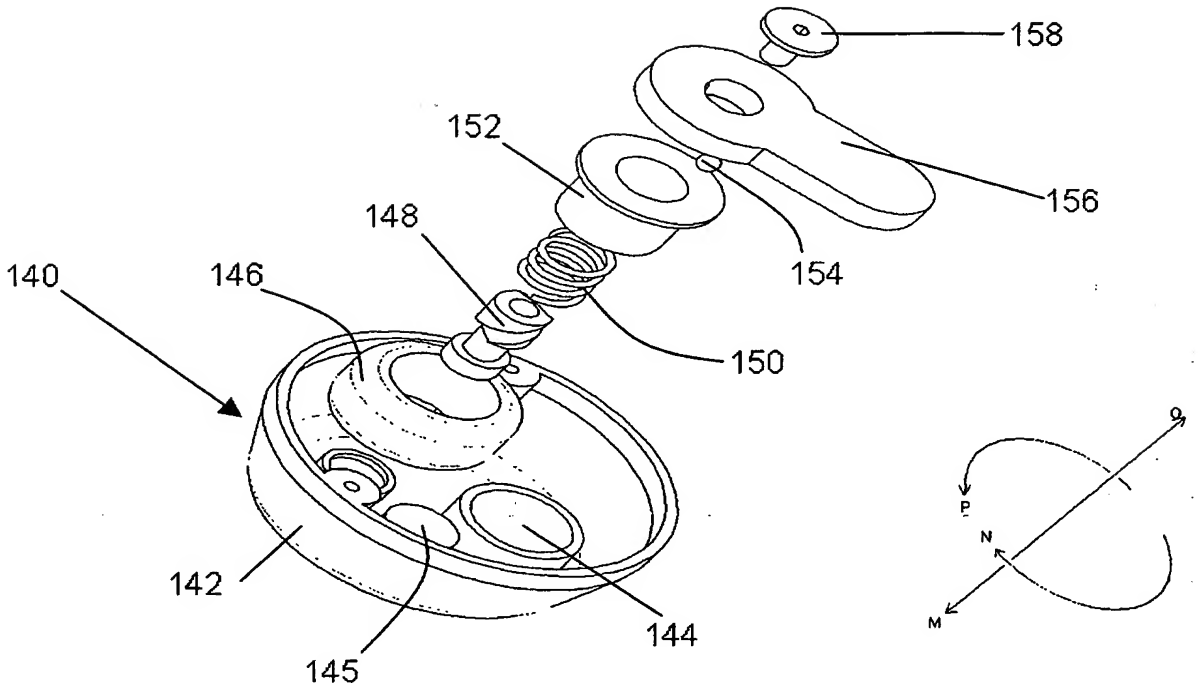
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FIG. 12

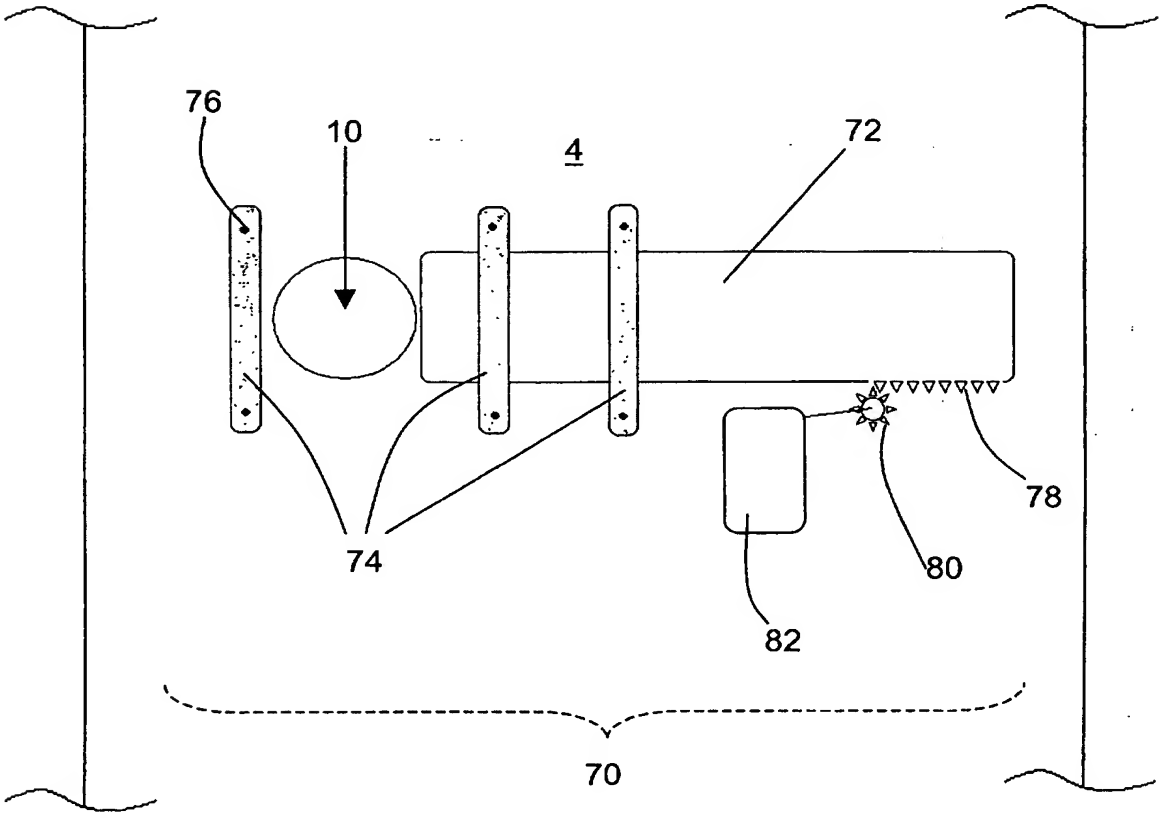
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FIG. 13

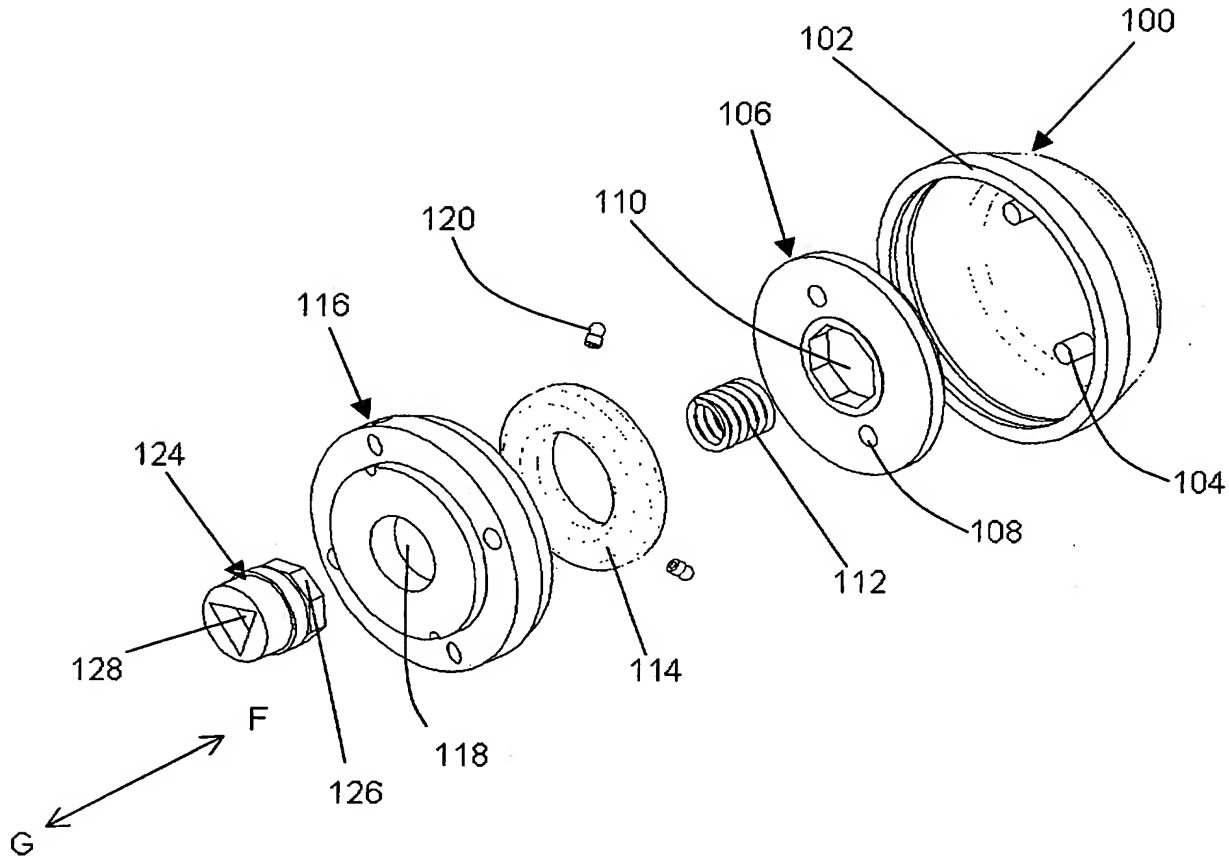
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FIG. 14

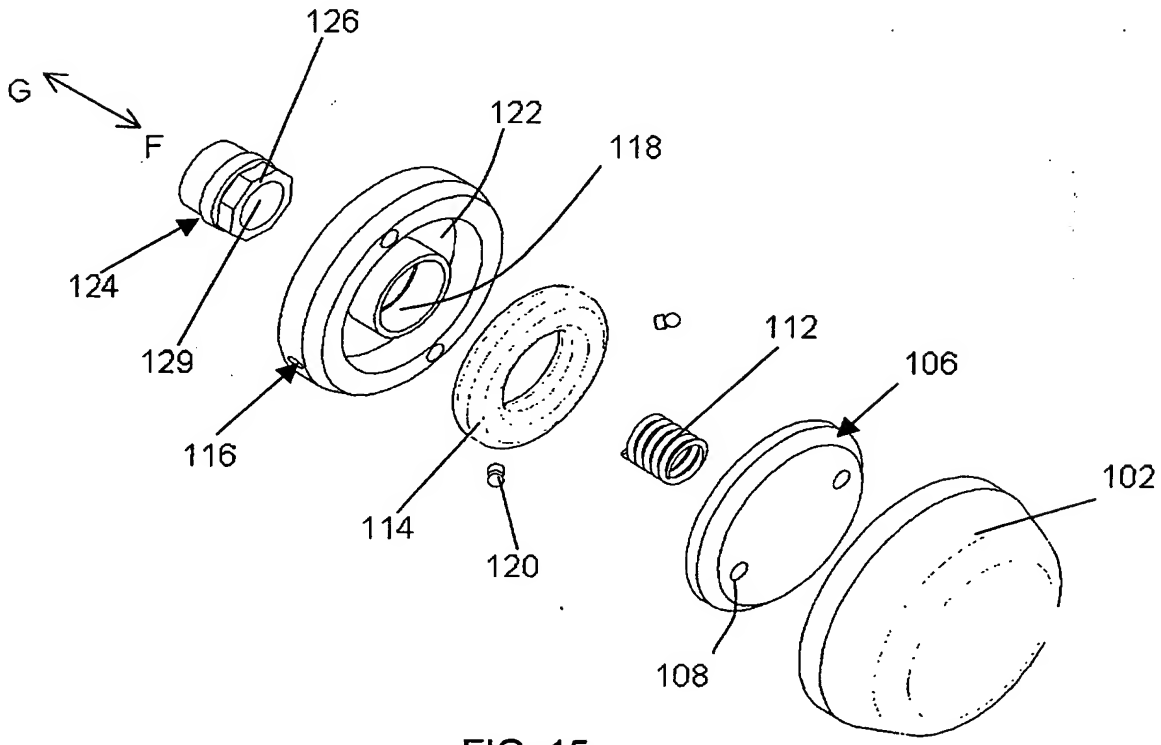
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FIG. 15